DCCUMENT RESUME

ED 03€ 045 24 EC 005 199

AUTHOR FREIHEIT, SUSAN GRETCHEN
TITLE THE EFFECTS OF A TRAINING PROGRAM UPON THE CREATIVE PERFORMANCE CF FOURTH GRADE CHILDREN; REPORT FROM THE PROJECT ON TASK AND TRAINING VARIABLES IN HUMAN PROBLEM SOLVING AND CREATIVE THINKING.
INSTITUTION WISCONSIN UNIV., MADISCN. RESEARCH AND DEVELCPMENT CENTER FOR COGNITIVE LEARNING.
SPONS AGENCY OFFICE OF EDUCATION (DHEW), WASHINGTON, D.C. CCOPERATIVE RESEARCH PROGRAM.
REPORT NO TR-79
BUREAU NO BR-5-0216
PUB DATE FEB 69
CONTRACT OEC-5-10-154
NOTE 123P.

EDRS PRICE EDRS PRICE MF-$0.50 HC-$6.25
DESCRIPTORS CREATIVE ABILITY, *CREATIVE DEVELOPMENT, *CREATIVE THINKING, CREATIVITY, *CREATIVITY RESEARCH, INSTRUCTIONAL MATERIALS, PROGRAM EVALUATION, TEACHING METHODS, WCRKBCOKS
IDENTIFIERS STRETCH WCRKBCOK

ABSTRACT

TO DETERMINE IF USE CF A CREATIVITY TRAINING WCRKBCOK (STRETCH) WOULD INCREASE CREATIVE PERFORMANCE, 45 FOURTH GRADE PUPILS WERE STUDIED. THE STUDENTS WERE DIVIDED INTO CONTROL AND EXPERIMENTAL GRCUPS WITH HALF HIGH (MEAN IQ 113) AND HALF NORMAL (MEAN IQ 101) ABILITY WITH THE CCNTROLS USING A PLACEBO WORKBOOK AND THE EXPERIMENTALS USING THE STRETCH WORKBOOK. THE DATA UPON PRE- AND POSTTESTING WITH THE TCRRANCE TESTS OF CREATIVE THINKING REVEALED NO SIGNIFICANT DIFFERENCES BETWEEN THE TWO GROUPS. HOWEVER, THE AUTHOR FELT FROM ANALYSIS AND INFORMAL CBSERVATION THAT STRETCH DID IMPROVE VERBAL ORIGINALITY, CERTAIN SCORES OF THE LCWER ABILITY GROUP IMPROVED MCRE THAN THE HIGHER ABILITY GROUP, AND ALL STUDENTS IMPROVED SIGNIFICANTLY ON AIMCST ALL MEASURES. THE AUTHOR INDICATES THAT THE WORKECOK HAS THE POTENTIAL TO EE HELPFUL IN CREATIVITY TRAINING. (JM)

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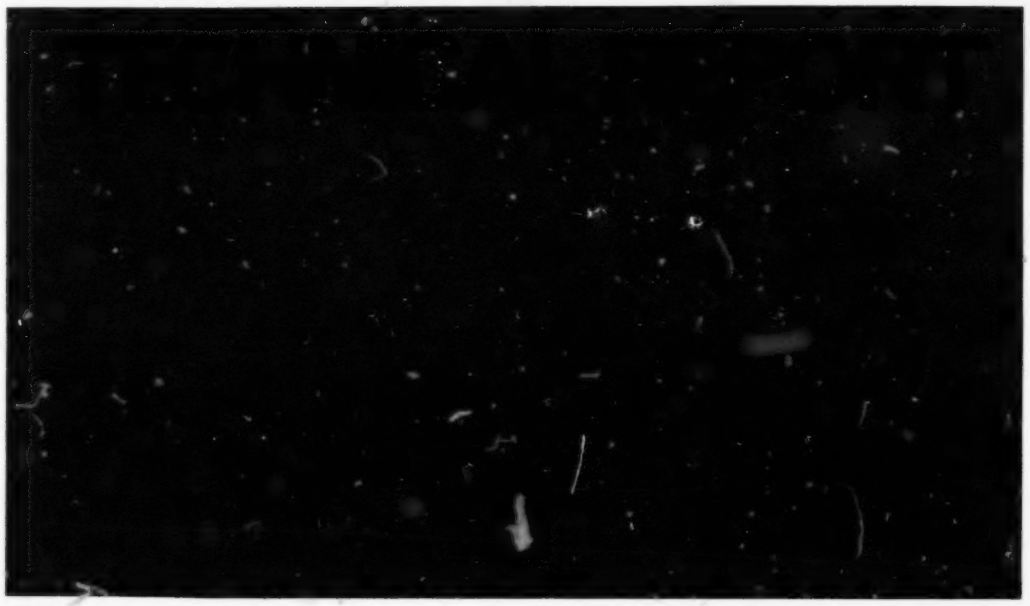

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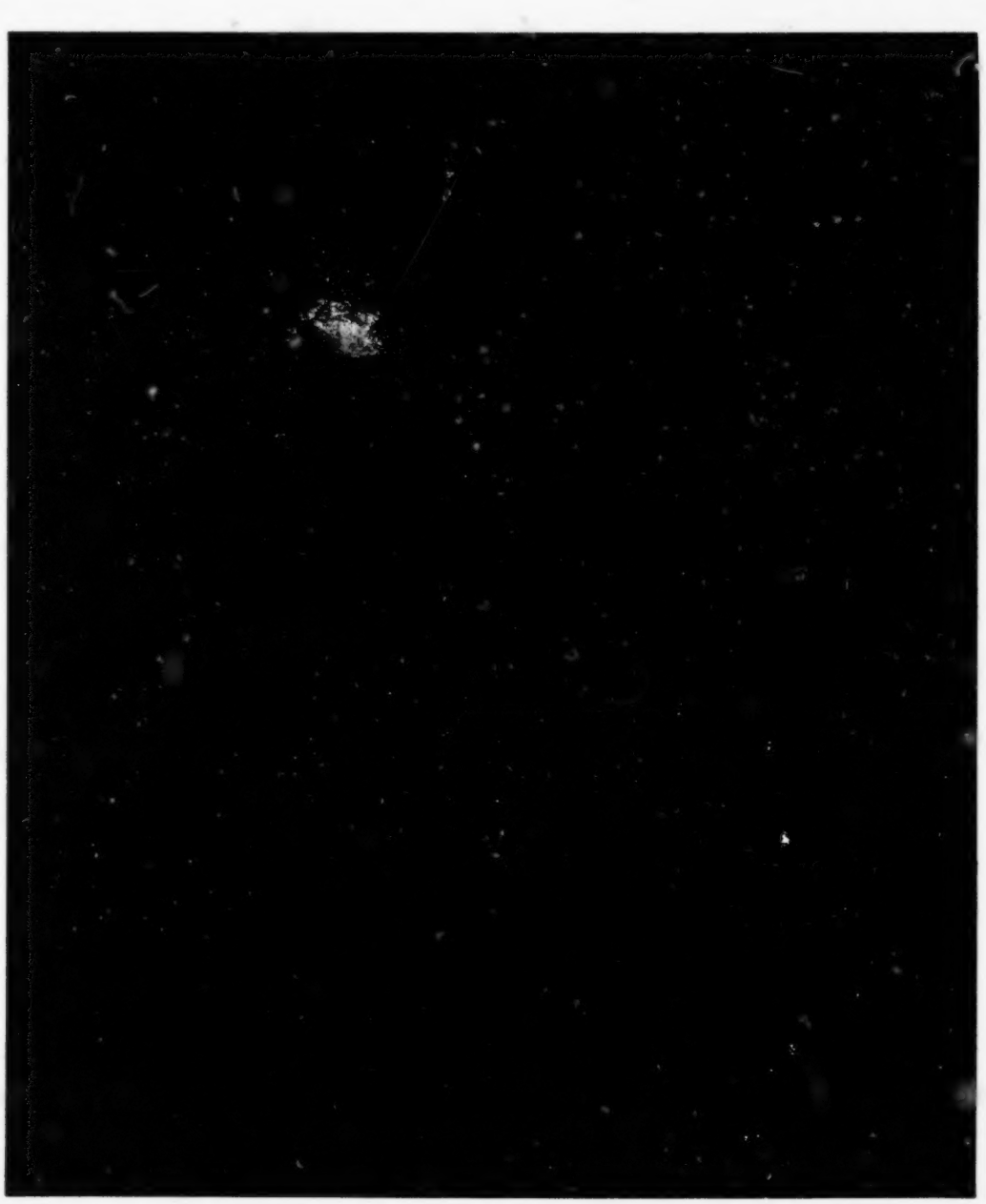

EC 005 192

U.S. Office of Education Center No. C-03 Contract OE 5-10-154

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Technical Report No. 79

THE EFFECTS OF A TRAINING PROGRAM UPON THE CREATIVE PERFORMANCE OF FOURTH GRADE CHILDREN

Report from the Project on Task and Training Variables in Human Problem Solving and Creative Thinking

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February 1969

This Technical Report is a master's thesis reporting research supported by the Wisconsin Research and Development Center for Cognitive Learning. Since it has been approved by a University Examining Committee, it has not been reviewed by the Center. It is published by the Center as a record of some of the Center's activities and as a service to the student. The bound original is in The University of Wisconsin Memorial Library.

The research reported herein was performed pursuant to a contract with the United States Office of Education, Department of Health, Education and Welfare, under the provisions of the Cooperative Research Program.

Center No. C-03 / Contract OE 5-10-154

STATEMENT OF FOCUS

The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students. These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Technical Report is from the Task and Training Variables in Human Problem Solving and Creative Thinking Project in Program 1. General objectives of the Program are to generate new knowledge about concept learning and cognitive skills, to synthesize existing knowledge, and to develop educational materials suggested by the prior activities. Contributing to these Program objectives, this project is focused on investigating creative problem solving as a trainable cognitive skill. The development and testing of creative thinking programs follows research on basic problem-solving variables in different situations.

ACKNOWLEDGMENTS

I would like to express deep appreciation to my advisor Dr. Gary Davis for his guidance in the development of this thesis. Special gratitude is also extended to Dr. Robert Davidson and Dr. Roger Severson for serving on my examining committee. Grateful acknowledgment is made to Jim Bavry of the Technical Section of the Research and Development Center for his suggestions and patient aid in the statistical work of the study.

Special appreciation is extended to Mr. Gary O'Hearn, Principal of Portage Grade School, Portage, Wisconsin and to Mrs. Peggy Aslasken, fourth grade teacher, for providing the facilities and subjects used in the experiment.

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ABSTRACT

The major purpose of this experiment was to determine whether a particular training program presented as an individual "self-contained" workbook would increase the level of creative performance of certain fourth grade pupils. The effect of the treatment was judged in terms of differences in gains in ability to do creative thinking, as measured by the Torrance Tests of Creative Thinking, between an Experimental and a Control Group. Differences between the performance of high and lower ability groups also were considered.

Two groups of fourth grade pupils, one Experimental and one Control, totaling 45 subjects, provided the population of the study. Both groups were pretested and posttested with the Torrance Tests of Creative Thinking.

The Experimental Group was exposed to a creativity training workbook, Stretch. The Control Group had no contact with this treatment variable. Instead, they studied a "placebo" workbook.

The major hypothesis of the experiment was that the Experimental Group would gain significantly more than the Control Group in both total verbal and total nonverbal creativity. The analysis of data revealed no significant differences. However, from analyses of the data plus informal observations, it seems reasonable to draw the

following conclusions: (1) It appears that Stretch did improve the level of performance of verbal originality of the pupils in the Experimental Group. (2) It appears that the scores on certain dependent measures by pupils of lower ability were more improved by Stretch than were those of high ability groups, although an "artificial ceiling" effect may have occurred. (3) All subjects, both Experimental and Control, improved significantly on almost all measures. The Torrance battery itself may have produced a practice effect and improved performance in creative thinking test scores.

No significant differences were found between the groups in attitudes toward creativity.

Despite the lack of convincing statistical data to support the hypotheses of this experiment, it is the opinion of the investigator that the Stretch workbook has the potential to be a valuable tool for the training of creative thinking in children.

Chapter I

INTRODUCTION

The general purpose of this experiment was to determine if a program of preplanned learning experiences designed to promote creative thinking, incorporated into a workbook entitled Stretch, would in fact increase the creative performance of a sample of fourth grade children. The specific problems investigated were: (1) Does experience with this creativity training program increase the level of creative thinking abilities, as measured by certain tasks? (2) Does the effect of this program depend to any extent on the ability of the children to which it is administered?

Importance of the Study

During the past fifteen years there has been an unprecedented volume of research and writing on the psychology of creativity, including the creative process itself, characteristics of the creative person and conditions favoring the production of creative work. Taylor (1959), for example, reported that a committee of seventeen leading psychologists placed the area of creativity and its cultivation at the top of a list of areas deserving high research priority in the behavioral sciences. The specific area within creativity that is receiving the greatest emphasis currently is the training of creative thinking skills.

This is an active and important component of the current revolution in educational curriculum, method and philosophy.

There is a legitimate place and need for training creative skills. By improving an individual's creative thinking skills, his flexibility and imagination, he should gain something of value to himself and to society. Also, the creative thinking skills are important when considering personality development and mental health--stifling the desire to be creative may be detrimental to one's normal development (Torrance, 1962). Creative thinking also contributes to the acquisition of information and is especially valuable in the application of knowledge to daily problems. Finally, the development and utilization of creative talent is vital to our society: "The future of our civilization depends upon the quality of the creative imaginations of our next generation" (Torrance, 1959).

Torrance (1964) further expressed this general feeling when he stated that the development of creativity should not be left to chance. Both laboratory and field experiments involving deliberate methods of improving the level of creative behavior have been convincingly favorable. Thus there is strong evidence that creativity need not be left to chance and, furthermore, should not be left to chance, since the development of creative thinking abilities lies at the core of achieving the most fundamental educational objectives, including the acquisition of the basic subject matters. It seems imperative then, that extensive research should be undertaken in order to find ways in which creative potential can be developed in every individual.

The present experiment is concerned with evaluating one very new program for developing creative potential in elementary school age children, the Myers and Torrance (1968) Stretch program.

Definition of Creativity

There are numerous definitions of creativity, ranging from very simple to very complex. In this study, the term creativity refers to

> "a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about deficiencies; testing and retesting these hypotheses, and possibly modifying and retesting them and finally communicating the results" (Torrance, 1963).

Implied in this definition is the creation of something new, something which has never been seen or which has never before existed. It involves thinking which departs from the obvious and commonplace, or divergent thinking, as contrasted with convergent thinking, which integrates what is already known and conforms to existing knowledge (Guilford, 1956).

Strong human needs are involved in creative thinking. Thus, Torrance (1963) explains, it is quite natural for man to learn creatively. The tendency to engage in divergent search processes directed toward potentially useful guesses about solutions is emphasized in Torrance's definition. Many other definitions of creativity also appear to point out that something in the thinking process sets off disturbing or frustrating influences which cause one to search for new, different or expanded answers to whatever the source of the disturbance or frustration (Britton, 1967; Comella, 1966).

Torrance's definition of creativity is expressed operationally in the Torrance Tests of Creative Thinking, the measuring instruments used in this experiment. This battery of tests measures "creative thinking abilities": the "constellation of generalized mental abilities that is commonly presumed to be brought into play in creative achievements" (Torrance, 1968).

In order to fully comprehend creativity as it is defined in this study, one also must think in terms of the context of a learning model of creativity.

A Learning Model of Creativity

When discussing the training of creativity, which is the concern of this investigation, it is advantageous to refer to creative behavior in the context of a model which emphasizes the critical role of learning in creativity. First, one must define what is meant by the creative idea in this model. There is near total agreement among workers in the field that a creative idea is the product of combining two or more previously unrelated ideas (Davis, Manske, & Train, 1967). This definition suggests that teaching creativity should partially include teaching methods for producing new idea combinations, which does occur to some extent in the training materials employed in the present study. Davis (1969) furthermore suggests that

> "creativity may be conceptualized as consisting mainly of three trainable components, (1) appropriate creative attitudes, the most critical of which is a favorable attitude toward highly imaginative problem solutions, (2) various cognitive abilities which facilitate whatever mental abstracting, combining, perceiving, associating, filling in gaps, etc., contribute to the fluent production of original ideas, and (3) techniques for the conscious and systematic production of new combinations of ideas."

In accord with Davis, it is assumed that each of these three components of creativity, attitudes, abilities, and techniques, may be improved or learned (for further discussion, see Davis, 1969).

Assumptions of the Study

In addition to the learning model of creativity, several other assumptions must be included when considering the training of creativity in a school situation. First, it was assumed that the abilities involved in creativity are universal and that these abilities may be increased by training within the educational setting (Wilson, 1958). It was further assumed that these abilities are used in one's daily life in the activities of invention, discovery, imagination and exploration. It was also assumed that creative behavior can be observed and measured with satisfactory reliability.

One finally must assume that creativity is manifested early in the life cycle and will benefit by guidance throughout its development. It would appear then, that a goal of education would be to guide creativity within the educational setting. Because children spend much of their time in school, and because there are fairly effective channels of communication between elementary school systems and educational researchers, it is a premise of this study that the elementary school holds a position in our society which is strategically and uniquely crucial for the development of this creative potential.

Hypotheses

The major hypothesis was that the mean gains in total verbal and nonverbal creative thinking abilities of the Experimental Group would be greater than those of the Control Group.

Specific hypotheses were: First, the mean gain in measured creativity, that is, (1) verbal fluency, (2) verbal flexibility, (3) verbal originality, (4) figural fluency, (5) figural flexibility, (6) figural originality, and (7) figural elaboration scores, would be greater for Ss in the Experimental Group than for Ss in the Control Group. Second, these gain scores would be independent of ability level.

A final hypothesis was that the treatment groups would differ in their total scores on a creative Attitude Survey, the Experimental Group showing more creative attitudes.

Chapter II

REVIEW OF RELEVANT LITERATURE

Background

Prior to 1950, little had been written in psychology or education on the nature of the creative process and its operation (Taylor & Barron, 1963). Taylor (1963) reported that interest diminished in this area mainly because there was "little in the way of results." Taylor also reported that Watson's Behaviorism, which did not allow for mentalistic concepts, had exerted such an early influence in psychology that an elusive mental ability such as imagination could not even be considered a legitimate scientific concern until the 1930's.

It was not until 1948-50 that the serious scientific study of creativity began. Guilford, in his 1950 presidential address to the American Psychological Association, reprimanded members for their neglect of the study of creativity. Through a 23-year examination of the index to Psychological Abstracts, he found only 186 titles out of 121,000 indexed which definitely dealt with the subject of creativity (Guilford, 1950). Guilford also advanced some general notions regarding the nature of creativity; one point being that all individuals possess creative abilities to some degree. Therefore, creativity is not limited to the gifted.

Guilford and his associates are responsible for setting the basis for our current understanding of and research in creativity. In 1952 Guilford, Wilson and Christensen issued a report of their findings, identifying specific factors of creativity and describing the batteries of tests used to measure these factors. The factors identified included: sensitivity to problems, associational fluency, ideational fluency, adaptive fluency, spontaneous flexibility, orignality, synthesis and closure and re-definition. Many researchers have utilized these factors (which Guilford incorporated into his "structure of intellect" model, a three-dimensional matrix representing the interactions of the operations, contents and products of thinking) and Guilford's tests as a starting point for their own investigations and test development. Lowenfeld at Pennsylvania State University, for example, issued a report in 1958 concerning a series of studies in which "criteria for creativity" were developed. These criteria were almost identical to Guilford's factors.

Recent Contributions

In addition to Guilford and his associates at the University of Southern California, who represent the earliest full scale effort to investigate creativity, there are at least five universities which have sponsored major contributions in the area of creativity. The Creative Education Foundation at the University of Buffalo (now the State University of New York at Buffalo, or SUNYAB), established in 1954 by Alex F. Osborn, is the most significant. For the past fourteen years Annual Creative Problem Solving Institutes have been held at

SUNYAB for the purpose of furthering research and development in creativity in education, industry and government. The Department of Art Education at Pennsylvania State University, directed by Kenneth Beittel since Lowenfeld's death, has contributed to the development of general creative performance through art education. Six national conferences on the Identification of Creative Scientific Talent have been held at the University of Utah under the direction of Calvin Taylor (Taylor, 1956, 1958, 1959; Taylor & Barron, 1963; Taylor & Williams, 1966). The Institute of Personality Assessment and Research at the University of California, Berkeley, led by Donald MacKinnon, has been concerned mainly with determining character traits of creative writers, artists, scientists and, particularly, architects (Barron, 1962).

The Bureau of Educational Research at the University of Minnesota, under the direction of E. Paul Torrance, now at the University of Georgia, has made considerable gains in developing assessment methods for identifying creative talent at all age levels and in studying and developing methods and conditions which affect creative growth. Manuals, workbooks and tape recordings have been developed on the elementary and secondary school levels (Torrance, 1967).

Other researchers in the nation also have developed programs and materials in conjunction with their creativity investigations. Two outstanding efforts are the inquiry training program at the University of Illinois (Suchman, 1960) and the adult-level Synetics programs (Gordon, 1961). Razik (1965) compiled a comprehensive bibliography on creativity. Among its 4176 references are numerous studies regarding experimentation in the stimulation of creative behavior.

Research Questions

Research questions in the literature center on five major problems: (1) Is there a relationship between the creative ability of individuals and such measures as tests of cognitive functioning, personality tests or other intellectual or nonintellectual instruments? (2) What are the effects of the various factors or "barriers" postulated to be inhibiting to productive thinking? (3) What is the relative effectiveness of individuals vs. groups in problem solving? (4) To what extent can creative behavior be deliberately stimulated? (5) What are the relationships among creativity, intelligence, and achievement?

The present study is concerned with the fourth question: the problem of the deliberate development of creative productivity. Until the time of the first Compendium on Research on Creative Imagination (Parnes, 1958), research dealt mainly with the identification of creative behavior (Parnes, 1966). About one half of the studies reported at the second Compendium (Parnes, 1960) were devoted to the intentional development of creativity (only two such studies were reported in 1958). The staff at Buffalo is currently compiling a third Compendium covering the period from 1960-1965. They already have discovered a large number of studies dealing with the development of creative behavior. Research findings tend to confirm the conviction expressed by Guilford (1952):

> "Like most behavior, creative activity probably represents, to some extent many learned skills. There may be limitations set on these skills by heredity; but I am convinced that through learning one can extend the skills within those limitations."

Detailed information concerning creativity research can be found in a wide variety of sources (Getzels & Jackson, 1962; Gowan, Demos &

Torrance, 1967; MacKinnon, 1961; Parnes, 1958, 1960; Parnes & Harding, 1962; Taylor, 1956, 1958, 1959, 1964; Taylor & Williams, 1966; Torrance, 1959, 1962, 1963). Throughout the literature are numerous references to the need for developing the creative potential in individuals through education. Roger C. Wilson (1958), in a discussion of the gifted, reported:

> "(a) that the abilities involved in being creative are universal, i.e., everybody possesses these abilities to some degree; (b) that these abilities are capable of being increased by training; and (c) that it is one of the school's legitimate functions to provide such training."

Creativity in Education

Torrance (1962) listed five important purposes which are served by assessing and guiding the growth of creative thinking abilities in education: (1) improving the mental health of school children, (2) educating children to grow into fully functioning persons, (3) achieving educational success, (4) achieving success in vocational pursuits, and (5) aiding children in making useful contributions to society. Assuming these statements are valid, it appears that educators should search actively for data that would expand their knowledge of children to include aspects of creativity, for curriculum experiences to increase creative thinking abilities and for ways of identifying early those children with a high degree of creativity. Furthermore, educators should evaluate over a considerable period of time the information obtained from the various studies of creativity with a view toward modifying or improving the school experiences of children.

The above seems to assume a vital role of methods of training creativity within the classroom. According to Davis (1967), "teaching creativity" in the schools can be arranged on a continuum, from very direct methods to very indirect methods. The various strategies, from the more direct to indirect include: (1) teaching idea-generating methods, which rarely occurs below the college level, (2) teaching systematic problem solving steps, which is the intent of the Covington, Crutchfield and Davies (1966) Productive Thinking Program, (3) changing school curricula in the direction of more creative courses, such as art, (4) teaching by the discovery method, (5) stimulating original thinking, which is a goal of the Myers and Torrance materials (to be described), (6) stimulating thinking within the context of the subject matter, and (7) merely providing a creative atmosphere. At present, relatively little emphasis is being placed on teaching directly for the development of creative behavior. Research indicates that media for developing creative thinking, such as the programs to be described here, are needed as well as the provision of a creative atmosphere (Beck, 1966).

Programs for the Direct Training of Creativity

There are several programs for training creativity within the elementary classroom. Also, there exists one designed especially for junior high students and one for use with high school students. Within the context of the present learning model of creativity, the content of these training programs is primarily concerned with fostering appropriate attitudes, teaching idea-generating techniques and strengthening innate abilities involved in the creative process.

Productive Thinking Program. The Covington, Crutchfield and Davies (1966) program, designed to systematically train problem solving skills to fifth and sixth grade pupils, was developed by the Carnegie Creativity Project at the University of California in 1965. This auto-instructional training program consists of a series of sixteen booklets, each about 40 pages in length, to be studied individually at a student's own pace. The importance of such attitudes as open-mindedness, perseverance and self-confidence in problem solving is stressed.

The program contains story material, the content of which takes the form of detective-like mysteries in a semi-cartoon format. There is a continuous story line throughout the booklets which involves the adventures of two school children, Jim and Lila, as they attempt to solve a series of mysteries under the guidance of Uncle John, a high-school science teacher and spare-time detective. The program is based on the idea that teaching creative problem solving requires both the strengthening of a variety of specific thinking skills central to the creative process and the encouragement of certain attitudes which favor the effective use of these skills. A student must be able to sense and identify a problem and to formulate it in workable terms. He must be able to call upon his concrete knowledge, principles and conceptual models which are relevant to the problem solution. He must be able to generate many ideas and, when blocked in solution attempts, formulate the problem in new and original ways. Consequently, the guides which Jim and Lila demonstrate teach the pupil to attack a problem in the above manner.

Studies testing the effectiveness of the program (Covington & Crutchfield, 1963; Crutchfield, 1964; Olton, Wardrop, Covington, Goodwin, Crutchfield, Klausmeier & Ronda, 1967) have shown significant improvement in creative problem solving ability in trained children.

Myers and Torrance Materials. Myers and Torrance have developed a series of five Idea Books for use with elementary school age children (Myers and Torrance, 1964, 1965a, 1965b, 1966a, 1966b). Briefly, the Idea Books consist of exercises which attempt to strengthen various abilities assumed to contribute to creative thinking. For example, students are exercised in remembering, free associating and elaborating upon wild ideas. They also seek to teach or "condition" attitudes conducive to creative thinking. (A detailed description of the Idea Books will be presented in the Method chapter.)

The five Idea Books have been tested for effectiveness, though the results of these studies have not yet been published. There have been indications of significant improvement in creative thinking abilities, however, (Britton, 1967; Torrance, 1968). At present, these materials remain in an essentially experimental stage.

The Imagi/Craft Series in Creative Development was produced by B. F. Cunnington and Torrance in 1964. The series, intended primarily for fourth grade pupils, includes recorded exercises and biographical recordings about creative people. Each of these recordings focuses on the role of creative problem solving, the importance of courage and other personality characteristics necessary for creative achievement, and planned, guided experiences in creative behavior (Torrance, 1965).

Thinking Creatively: A Guide to Training Imagination. Davis and Houtman (1968) have developed a creativity program for use with sixth to eighth grade students. This program

> "represents an effort to combine the main components of the various strategies for stimulating creativity into a package which is both interesting and informative for adolescents. It attempts to increase students' awareness of and appreciation for novel ideas, to teach techniques for producing new idea combinations, to provide exercises for some creative abilities, and, through humor, to create a free atmosphere encouraging spontaneity and imagination" (Davis, 1969).

Studies of the program's effectiveness are currently in progress.

Creative Problem Solving Course. Since 1949, Sidney J. Parnes and his associates have offered a course in creative thinking at the University of Buffalo (Parnes, 1962). The course seems to focus on the "forced" procedures utilized successfully in industry to systematically generate ideas. Osborn's Applied Imagination has been used as the course text and, consequently, the principle of deferred judgment is strongly emphasized. In addition to instruction and practice in brainstorming, the students become familiar with other idea-generating techniques, such as the use of checklists and the attribute listing procedure. Students also are instructed as to such vital issues as cultural, perceptual and emotional blocks to creative imagination, keeping idea records, finding and defining problems and the notion that every individual can increase his creative potential with training and practice.

Parnes (1966) is presently researching his auto-instructional materials which are intended to develop creative behavior in high school

and college students. This program is based on the creative problem solving course. The research is designed to determine to what extent his auto-instructional materials provide for the deliberate development of one's creative behavior and at the same time assure mastery of the subject matter. Thus, Parnes is attempting to couple creativity training with the acquisition of course content.

Indirect Methods of Teaching Creativity

There is more indirect than direct teaching of "creativity" currently in the school classrooms. "Indirect" teaching consists mainly of developing a creative atmosphere within the classroom. Learning by discovery also would appear to be an indirect means of teaching creative problem solving.

Creative Atmosphere. Many scholars have prepared lists of ways to stimulate creativity in the classroom, for example, Ausubel (1964), Davis, Manske, and Train (1967), Eisner (1963), Guilford (1962), Klausmeier and Goodwin (1966), Strang (1961), and Torrance (1962). The suggestions range from changing curricula in the direction of courses more conducive to creative expression to exposing children to a large variety of instructional materials. Strang (1961), in her list, mentions that to foster creative experience in the classroom, a teacher must recognize and encourage all signs of creativity. She must also create a permissive atmosphere which encourages all to participate. Strang emphasizes the vital role of the teacher, as do the majority of writers who discuss teaching that is conducive to creativity.

Torrance (1964) also describes the responsive environment which he feels the teacher should provide. It is one involving a sensitive and alert type of guidance, creating an atmosphere of receptive listening, responding to children as they are rather than as they have been told they are, resisting ridicule and criticism, and making the children's efforts to learn worthwhile.

Learning by Discovery. Though learning by discovery could be considered to be a component of the creative atmosphere, it has received considerable attention as a method in itself for fostering creative learning and developing problem solving skills.

Basically, learning by discovery involves the teaching of an association, concept or rule which involves actual discovery of the rule. The discovery process can result either from inductive or deductive teaching (Shulman, 1966). Torrance (1963) stated that man prefers to learn creatively by exploring, manipulating, questioning, experimenting, testing and modifying ideas, which is essentially what constitutes learning by discovery. Wittrock (1966) cautioned that although there have been many strong claims in education for learning by discovery, there has been little substantial experimental evidence to support these claims. Learning by discovery, then, appears to remain basically an hypothesis.

Summary

There clearly is evidence that creativity in the individual can be nurtured and guided by means of instructional procedures directed toward this end. However, it seems likely that the lack of a clear definition

plus an obscure understanding of the basic processes involved in creativity complicate the planning of sound educational programs for guiding creative potential (Passow, 1965). There truly is relatively little material available for training creativity within the schools.

If the purpose of education is "the full-rounded and continuing development of the individual," then all aspects of mental functioning should be well cultivated through educational media (Yamamoto, 1964), particularly the creative thinking abilities. As Parnes (1963) has expressed

> "We still know very little about what 'creativity' really is. But we do know how to stimulate greater creative behavior in individuals. It is a matter of helping them to release whatever creative potential they possess."

It is the purpose of this study to evaluate one program for developing creative potential.

Chapter III

METHOD

Subjects

The Ss were 48 fourth grade pupils from Portage Grade School in Portage, Wisconsin. Fourth grade pupils were chosen primarily because, of the age groups recommended for use with the Stretch workbook (first through fifth grades, approximately), fourth grade pupils are the youngest students to whom the Torrance test battery can be group administered.

The fourth grade pupils in Portage are ability grouped into four groups (A, B, C, D) according to teacher recommendations Stanford Achievement Test scores and classroom performance. Ability groups A and C, the highest and third highest groups (mean IQ=113 and 101, respectively), participated in this experiment. These two ability groups, to be referred to as "high" and "low" in this report, were chosen for the purpose of observing any differential effects of the experimental treatment upon pupils of different abilities. From ability group A, 12 pupils were randomly assigned to the Experimental Group and 11 were assigned to the Control Group. From Group C, 13 pupils were randomly assigned to the Experimental Group and 12 to the Control Group. Random assignment was achieved by drawing names from a box.

Three Ss in the Experimental Group were eliminated from the data analyses since they moved from the area before the posttests could be administered, leaving 10 Experimental Ss in Group A and 12 Experimental Ss in Group C. The final total sample for all data analyses was, therefore, 45 Ss.

Measuring Instruments

The main measuring instruments employed were the Torrance Tests of Creative Thinking, Verbal and Nonverbal, Forms A and B. These tests were considered to be the most reliable and valid instruments available for measuring creativity. Also, they were developed by one author of the Stretch workbook, thus achieving consistency of the creativity model in both the independent and dependent experimental variables. Other measuring instruments included an experimenter-devised Attitude Survey, a questionnaire concerning Stretch, and a Teacher Evaluation Form.

Torrance Battery. In 1958 Torrance and his associates at the Bureau of Educational Research, University of Minnesota, began developing his Torrance Tests of Creative Thinking. Their first attempt was to adapt Guilford's (1951) materials into tests of their own. At the same time, experimentation with other types of tasks began. These tasks were assumed to be models of the creative process, involving several types of thinking. In their present form, the Torrance Tests, published in 1966, represent the culmination of nearly nine years' research. The battery includes both tests initially

devised by Guilford and tests developed by Torrance himself. There are four separate test booklets, two verbal tests (Verbal Form A and Verbal Form B) and two figural tests (Figural Form A and Figural Form B). A "Directions Manual and Scoring Guide" describes in detail how each individual subtest is to be administered and scored.

The Verbal Test consists of seven subtests. Each subtest is believed to require somewhat different mental processes, though each requires the subject to think divergently. The verbal subtests include: (1) Ask and Guess, which requires S to ask questions about a drawing; (2) Guess Causes, in which S guesses the causes of the event pictured; (3) Guess Consequences, which asks S to think of what might happen as a result of the event pictured; (4) Product Improvement, in which S produces ideas for improving a toy so that it will be "more fun to play with"; (5) Unusual Uses, requiring S to think of uses for tin cans or cardboard boxes; (6) Unusual Questions, in which S thinks of questions about aspects of, e.g., cardboard boxes; and (7) Just Suppose, which asks S to think of the possible consequences of an improbable event.

The Figural Test includes: (1) Picture Construction, in which the subject must draw a picture using a given shape as a part; (2) Incomplete Figures, which involves adding lines to ones on the page in order to make some meaningful form; and (3) Repeated Figures, in which the subject is to make pictures out of repeated circles or sets of parallel lines. Since there is insufficient time to complete all of the possible units, making them both original and elaborate, response preferences emerge.

The dependent scores emerging from these subtests include verbal fluency, verbal flexibility, verbal originality, figural fluency, figural flexibility, figural originality, and figural elaboration. While fluency is defined as the ability to generate many similar ideas, e.g., thinking of uses for a tin can such as a flower pot, pencil container, and marble container, flexibility is the ability to generate ideas in many different categories, e.g., thinking of toys and weapons as uses for a tin can. Originality is operationally defined as the ability to generate statistically uncommon responses, e.g., thinking of a tin can as a Kaleidoscope. Elaboration is the ability to "spell out" the idea in detail, such as adding a television antenna, control knobs and cabinet to a "TV screen" in the circle completion task.

Pupils are introduced to these tests by being told that they are tests of their ability to use their imaginations and think of new ideas. (For sample instructions, see Appendix A.)

In order to be useful in education, a test must be valid and reliable. Unfortunately, few test-retest reliability studies have been conducted with all four complete tests being administered to the same pupils. For the four individual tests, test-retest reliabilities have been established with coefficients typically in the .70-.80 range (Torrance, 1966), .80 being acceptable for research usage on groups (Torrance & Gowan, 1963). According to Torrance (1966), test-retest reliability coefficients are generally higher for the verbal tests than for the figural tests, and for fluency and flexibility scores as contrasted with originality and elaboration scores.

Regarding validity, Torrance (1966) has noted that:

> "Since a person can behave creatively in an almost infinite number of ways and since there is a diversity of definitions of creativity, it would be impossible to provide all research workers and potential users of tests of creative thinking with satisfactory evidence of validity."

With regard to content validity, Torrance admits that these tasks do not sample the entire realm of creative abilities. There is, however, a concrete theoretical rationale for selecting these particular tasks (Torrance, 1966). Concerning construct validity, several studies have been conducted with the intent of increasing the understanding of the abilities measured by the tests. Some of the studies have involved the relationship of personality characteristics to high and low creativity scores (Weisberg & Springer, 1961) while others have involved simple correlations between creativity scores and other measures of intellectual abilities (Bowers, 1966). Torrance and his associates have been unable to find any generally acceptable criteria of concurrent validity (Torrance, 1966). Studies investigating predictive validity are currently in progress (Torrance, 1966).

Attitude Survey. This 18-item experimenter-devised instrument, designed to assess the pupils' attitudes concerning new ideas and thinking, uses 9-point rating scales (see Appendix B). It was assumed that each statement's rating accurately reflected the S's attitude regarding that statement.

Stretch Questionnaire. This instrument was devised by the present experimenter to obtain the Experimental Ss' opinions of the treatment workbook. The questionnaire, also based on a 9-point rating scale,

consists of four statements to be rated plus one open-ended question (see Appendix C).

Training Materials

Stretch, the treatment variable, consists of a 22-unit workbook developed by Myers and Torrance (1968). Patterned after its predecessors, the five Idea Books, Stretch is intended, primarily, to teach attitudes conducive to creative thinking. Children are presumed to learn that highly imaginative thinking is valued through exercises asking them such questions as "Does a chair go?" and "What would happen if your teacher forgot how to write?"

Stretch also attempts to increase some of the innate perceptual and cognitive abilities which are assumed to underlie creative performance, including evaluation, divergent production and re-definition. To the writer's knowledge, the Idea Books constitute the only program for elementary school age children which endeavors to strengthen specific creative abilities through exercise. Children are given practice in remembering, perceiving relationships, imagining and elaborating on wild ideas, predicting or making up consequences of unusual events, filling in information gaps, pretending and being aware of sights and sounds. This strategy employed by Myers and Torrance is consistent with Guilford's suggestion that his factor analytically defined abilities could be strengthened by giving exercises similar to the tests which measure those abilities (Davis, 1969; Guilford, 1962).

Stretch differs from the other Idea Books in that it presents its creativity-training exercises within the context of teaching 22 important concepts, both sociological and intellectual in nature, which can be introduced to young children (Myers and Torrance, 1968). For example, one unit entitled "Going, Gone" deals with the concept of movement. The child is asked "Does a chair go?" and "Where does your summer vacation go?" Other concepts presented are sound, novel combinations, moderation, judgment, contrast, neighborliness, personality, belonging, personification, extension, deception, proof, propriety, individuality, sharing, readiness, memory, cycles, customs, change and repetition.

These concepts, related to everyday living, are presented in an inductive format: the child is confronted with several situations and is then asked to generalize or "reach conclusions" about these situations. The student need not verbally formulate a concrete generalization nor specifically name the concept. Teaching the underlying meaning of the concept is the goal. For example, in the unit entitled "Hal and Three More," concerned with the concept of neighborliness, the child is asked as a final question, "What would be a better name for this story than 'Hal and Three More'?"

Each unit is organized into three parts: an introductory or warming-up phase; a second phase, in which the pupil is encouraged to become more deeply involved in the concept or activity; and a follow-through phase, in which the pupil is invited to "take-off" on

the idea and express himself in some form. As an example, in Unit 3: "Stop," the pupil is invited to draw a picture of a child who did not know when to stop.

A "Teacher's Guide" (Myers & Torrance, 1968) has been prepared in which the authors explain the rationale of each unit and suggest specific guides for the teacher to follow when presenting the units. These guidelines were not closely followed in this experiment, since the intent was to test Stretch as an independent study workbook--a material with which the pupil could work in his free time.

Placebo

The Sullivan Programmed Reading Book 12, Level 1 (Sample page in Appendix E), was used to occupy the Control Ss in each ability group while the Experimental Ss were working with Stretch. This procedure also tended to arrest the Control Ss' curiosity concerning Stretch and enabled them to feel as if they, too, were participating in the experiment. Each group then had its own workbook.

Teacher Evaluation Form

The Teacher Evaluation Form, given to the teacher at the outset of the experiment, was a form suggested in the Norms-Technical Manual (Torrance, 1966; see Appendix F) to provide the teacher with an opportunity to personally assess her pupils' creative thinking abilities.

Procedure

As a pretest, the Torrance Tests of Creative Thinking, Verbal and Nonverbal, Form B, were administered by the investigator at the

outset of the experiment. The Tests were administered to all Ss as a group in a large testing room in two sessions, the Verbal Test one day and the Nonverbal Test three days later.

A single teacher administered both the treatment and the "placebo" to both ability groups. Under the Portage team teaching system, all ability groups are exposed to several teachers each day. Thus, both ability groups participating in this experiment had the same amount of daily interaction with the one participating teacher.

Before Stretch was introduced to the pupils, the investigator familiarized the teacher with the materials and the underlying concept of creativity. A brief form of the Teacher's Guide was given to the teacher to use as a guide (see Appendix G). The teacher was instructed to give only minimal directions since, again, the intent was to test the workbook as a tool to be used independently by the pupils. Since the elementary school curriculum is already quite heavily loaded with various subjects, and teachers are not always anxious to accept an innovation, it was felt that a workbook to be used by the pupils in their free time, rather than one which would require much teacher direction, would be more readily acceptable. Therefore, the present study was designed to examine the instructional limits of the training program by using it as an almost self-contained program, with all forms of teacher participation kept at a minimum.

Stretch was administered unit by unit over a period of five weeks. One-half hour during the daily schedule was devoted to each unit. The period of time was held constant each day.

The Control Ss learned the programmed reading material while the Experimental Ss worked on Stretch. Both sets of workbooks were collected by the teacher at the close of each session. Pupils were not permitted to examine the workbooks with which they were not working, nor could they inspect their own workbooks outside of the scheduled half-hour sessions.

At the close of the experiment, both Experimental and Control Groups received the posttests, the Torrance Tests of Creative Thinking, Verbal and Nonverbal, Form A. The investigator again tested all pupils at once in two sessions, the Verbal Test one day and the Nonverbal Test three days later. After the posttests had been given, Ss in both groups also received the Attitude-Survey intended to measure their attitudes toward new ideas and creative thinking (see Appendix B). The Experimental Ss were given an additional questionnaire concerning their experience with Stretch (see Appendix C).

The pretests and posttests were scored by the experimenter, carefully following the scoring directions in the"Directions Manual and Scoring Guide" which accompanies each test. A sample scoring sheet appears in Appendix H.

Analyses

Pretest scores were analyzed in a 2 X 2 ANOVA* to determine any differences between the Experimental and Control Groups or any differences between ability groups at the outset of the experiment.

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*Data were analyzed with the Finn Computer Program and the University of Wisconsin Computing Center Statjob Two-way 1 Program.

A 2 X 2 X 2 factorial design with repeated measures was performed to reveal any significant gains on any of the dependent measures and to determine if Ss in the Experimental Group gained significantly more than Ss in the Control Group. The factors represented in the design are Treatment (Experimental vs. Control), Ability (High vs. Low) and Change (pre-post measures).

Since there was a difference on pretest scores between the Experimental and Control Groups on some of the dependent measures, and between ability groups on some of the dependent measures, an analysis of covariance was run on all dependent variables to adjust for these initial differences.

A two-way ANOVA was performed on the total "creativity" scores obtained from the Attitude Survey. A total creativity score was obtained for each S by summing his ratings over the 18 statements. For the analysis, the ratings on statements 3, 8, 9, 11, 13, 14, 15, and 17 (see Appendix B) were reversed in order to make the "9" rating consistently the highest end of the rating scale.

An alpha of .05 was set as an acceptable level of statistical significance.

Chapter IV

RESULTS

Torrance Tests

In the following, scores from the Torrance Tests of Creative Thinking will be designated as verbal fluency (VFLU), verbal flexibility (VFLEX), verbal originality (VO), figural fluency (FFLU), figural flexibility (FFLEX), figural originality (FO), and figural elaboration (FE). A total verbal creativity score, obtained by the addition of VFLU, VFLEX, and VO, is indicated by TV and a total nonverbal creativity score, obtained by adding FFLU, FFLEX, FO and FE, is indicated by TNV.

The data on the pretest ANOVA revealed that the Experimental Group's mean pretest score on FO was significantly higher than the mean score of the Control Group (Table 1). The Experimental Group also scored significantly higher on TNV (Table 2). Thus, the treatment groups were not equivalent on all dependent measures at the outset of the experiment.

On VFLU, VFLEX and VO, it was found that pretest scores for Ss in the high ability group were significantly higher than for Ss in the low ability group (Tables 3, 4, and 5). Also, on TV, Ss in the high ability group scored significantly higher than Ss in the low

Table 1

Summary of Analysis of Variance on Pretest
Figural Originality Scores (FO)

Source	df	MS	F	p
A (treatment)	1	969.50	7.00	.012
B (ability)	1	219.66	1.58	.215
AB	1	218.66	1.58	.216
error	41	138.61	--	--
Total	44	1546.43	--	--

Table 2

Summary of Analysis of Variance on Pretest Total Nonverbal Creativity Scores (TNV)

Source	df	MS	F	p
A (treatment)	1	3590.75	4.32	.044
B (ability)	1	410.43	.49	.486
AB	1	849.80	1.02	.318
error	41	831.62	--	--
Total	44	5682.60	--	--

Table 3

Summary of Analysis of Variance on Pretest
Verbal Fluency Scores (VFLU)

Source	df	MS	F	p
A (treatment)	1	13.90	.10	.758
B (ability)	1	1264.38	8.74	.005
AB	1	973.36	6.72	.013
error	41	144.74	--	--
Total	44	2396.38	--	--

Table 4

Summary of Analysis of Variance on Pretest
Verbal Flexibility Scores (VFLEX)

Source	df	MS	F	P
A (treatment)	1	23.12	.55	.464
B (ability)	1	325.01	7.69	.008
AB	1	117.22	2.77	.104
error	41	42.27	--	--
Total	44	516.62	--	--

Table 5

Summary of Analysis of Variance on Pretest
Verbal Originality Scores (VO)

Source	df	MS	F	P
A (treatment)	1	5.83	.08	.782
B (ability)	1	757.91	10.10	.003
AB	1	581.37	7.74	.008
error	41	75.07	--	--
Total	44	1420.18	--	--

ability group (Table 6). No significant pretest differences were found on FFLU, FFLEX and FE (Tables 7, 8, and 9). Thus, the ability groups also were not initially equivalent on all dependent measures.

A significant Treatment-Ability interaction was found on TV and on VFLU and VO (Tables 3, 5, and 6). From examining the pretest means in Table 10, it is apparent that these significant interactions stem from the fact that the high ability Control (CH) Ss scored significantly higher on these measures than did low ability Control (CL) Ss. The scores of high ability Experimental (EH) vs. low ability Experimental (EL) Ss did not differ significantly. This interactional pattern of results was not evident with figural scores (Table 11).

With the scores for which there were significant pretest differences (TV, TNV, VFLU, VFLEX, and FO), posttest differences were deemed unexplainable or ambiguous. However, analyses of gain scores for these measures seemed reasonable and justifiable.

Tables 12 and 13 reveal a highly significant overall gain for all Ss on both TV and TNV on the repeated measures ANOVA, which considers pretest vs. posttest scores. There also were highly significant gains for all Ss on VFLU, VFLEX, FFLU, FFLEX, and FO (Tables 10, 11, 14, 15, 16, 17 and 18). The VO measure approached significance (Table 19), and a significant loss over all Ss was found on FE (Table 20).

The main hypothesis of this experiment, that the gains of the Experimental Group on TV and on TNV would be significantly greater than those of the Control Group, was not supported by the data. However, specific hypothesis 3 was given some support: A treatment effect

Table 6

Summary of Analysis of Variance on Pretest
Total Verbal Creativity Scores (TV)

Source	df	MS	F	P
A (treatment)	1	119.94	.19	.664
B (ability)	1	6579.83	10.48	.002
AB	1	4374.13	6.97	.012
error	41	627.57	—	—
Total	44	11701.47	--	--

Table 7

Summary of Analysis of Variance on Pretest
Figural Fluency Scores (FFLU)

Source	df	MS	F	P
A (treatment)	1	12.46	.34	.565
B (ability)	1	35.95	.97	.330
AB	1	.24	.01	.936
error	41	36.94	--	--
Total	44	85.59	--	--

Table 8

Summary of Analysis of Variance on Pretest
Figural Flexibility Scores (FFLEX)

Source	df	MS	F	P
A (treatment)	1	.70	.02	.875
B (ability	1	13.88	.30	.483
AB	1	3.25	.12	.734
error	41	27.74	--	--
Total	44	45.47	--	--

Table 9

Summary of Analysis of Variance on Pretest
Figural Elaboration Scores (FE)

Source	df	MS	F	p
A (treatment)	1	596.59	1.93	.173
B (ability)	1	18.34	.06	.809
AB	1	245.76	.79	.378
error	41	309.91	--	--
Total	44	1170.60	--	--

Table 10

Pretest and Posttest Means, Verbal Scores

Group	VFLU		VFLEX		VO		TV	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
EH	35.20	45.10	19.20	25.70	13.40	17.50	67.80	88.30
EL	34.17	46.33	17.17	23.17	12.58	16.50	63.92	86.00
Total E	34.64	45.77	18.09	24.32	12.95	16.95	65.86	108.44
CH	46.27	47.45	24.09	26.18	21.82	17.00	92.18	90.63
CL	26.58	41.50	15.58	23.75	6.58	10.92	48.75	76.17
Total C	36.00	44.35	19.65	24.91	13.87	13.83	70.47	96.34
Total H	41.00	46.33	21.76	25.95	17.81	17.24	79.99	98.94
Total L	30.38	43.92	16.38	23.46	9.58	13.71	57.31	106.81

E = Experimental
C = Control
H = High Ability
L = Low Ability

Table 11

Pretest and Posttest Means, Nonverbal Scores

Group	FFLU		FFLEX		FO		FE		TNV	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
EH	18.30	22.90	14.40	17.40	33.10	35.10	48.20	43.30	114.00	118.70
EL	16.33	24.83	13.83	20.75	23.92	30.58	44.50	30.92	98.58	107.08
Total E	17.23	23.95	14.09	19.23	28.09	32.64	46.18	36.55	106.29	119.49
CH	17.09	23.36	14.73	18.55	19.09	28.36	35.91	33.36	86.82	103.64
CL	15.42	24.33	13.08	19.83	18.75	27.75	41.58	34.00	88.83	105.91
Total C	16.22	23.87	13.87	19.22	18.91	28.04	38.87	33.70	87.83	121.73
Total H	17.67	23.14	14.57	18.00	25.76	31.57	41.76	38.10	100.41	121.93
Total L	15.88	24.58	13.46	20.29	21.33	29.17	43.04	32.46	97.06	122.64

E = Experimental
C = Control
H = High Ability
L = Low Ability

Table 12

Summary of Analysis of Variance on
Total Verbal Creativity Scores (TV)

Source	df	MS	F	p
Between	44	10783.36		
A (treatment)	1	4.49	.00	.948
B (ability)	1	5980.18	5.65	.022
AB	1	3740.15	3.53	.067
error (b)	41	1058.54	--	--
Within	45	9788.05		
C (pre-post)	1	6794.72	28.60	.000
AC	1	310.03	1.31	.260
BC	1	1397.56	5.88	.020
ABC	1	1048.17	4.41	.042
error (w)	41	237.57	--	--

Table 13

Summary of Analysis of Variance on
Total Nonverbal Creativity Scores (TNV)

Source	df	MS	F	p
Between	44	6931.55		
A (treatment)	1	3659.25	2.82	.101
B (ability)	1	601.41	.46	.500
AB	1	1372.43	1.06	.310
error (b)	41	1298.46	--	--
Within	45	4195.45		
C (pre-post)	1	3228.01	9.36	.004
AC	1	588.16	1.71	.198
BC	1	17.03	.05	.825
ABC	1	17.47	.05	.823
error (w)	41	344.78	--	--

Table 14

Summary of Analysis of Variance on
Verbal Fluency Scores (VFLU)

Source	df	MS	F	p
Between	44	2161.70		
A (treatment)	1	.02	.00	.993
B (ability)	1	953.23	3.47	.070
AB	1	933.94	3.40	.072
error (b)	41	274.51	--	--
Within	45	2777.39		
C (pre-post)	1	2121.88	37.59	.000
AC	1	43.72	.77	.384
BC	1	371.44	6.58	.014
ABC	1	183.90	3.26	.079
error (w)	41	56.45	--	--

Table 15

Summary of Analysis of Variance on
Verbal Flexibility Scores (VFLEX)

Source	df	MS	F	p
Between	44	1378.01		
A (treatment)	1	26.14	.35	.557
B (ability)	1	343.49	4.61	.038
AB	1	933.94	3.40	.072
error (b)	41	74.44	--	--
Within	45	871.62		
C (pre-post)	1	739.60	36.69	.000
AC	1	5.25	.26	.613
BC	1	46.15	2.29	.138
ABC	1	60.46	3.00	.091
error (w)	41	20.16	--	--

Table 16

Summary of Analysis of Variance on
Figural Fluency Scores (FFLU)

Source	df	MS	F	p
Between	44	67.03		
A (treatment)	1	6.74	.11	.737
B (ability)	1	.80	.01	.908
AB	1	.63	.01	.918
error (b)	41	58.86	--	--
Within	45	1250.11		
C (pre-post)	1	1166.40	67.24	.000
AC	1	4.81	.28	.601
BC	1	59.34	3.42	.072
ABC	1	2.21	.13	.723
error (w)	41	17.35	--	--

Table 17

Summary of Analysis of Variance on
Figural Flexibility Scores (FFLEX)

Source	df	MS	F	p
Between	44	62.52		
A (treatment)	1	.30	.01	.932
B (ability)	1	7.71	.19	.666
AB	1	13.78	.34	.564
error (b)	41	40.73	--	--
Within	45	697.85		
C (pre-post)	1	618.84	50.50	.000
AC	1	.25	.02	.887
BC	1	65.15	5.32	.026
ABC	1	1.36	.11	.741
error (w)	41	12.25	--	--

Table 18

Summary of Analysis of Variance on
Figural Originality Scores (FO)

Source	df	MS	F	p
Between	44	1749.98		
A (treatment)	1	1066.16	6.30	.016
B (ability)	1	287.35	1.70	.200
AB	1	227.15	1.34	.254
error (b)	41	169.32	--	--
Within	45	1304.54		
C (pre-post)	1	1067.78	18.11	.000
AC	1	118.19	2.00	.164
BC	1	25.49	.43	.515
ABC	1	34.12	.58	.451
error (w)	41	58.96	--	--

Table 19

Summary of Analysis of Variance on
Verbal Originality Scores (VO)

Source	df	MS	F	p
Between	44	1429.70		
A (treatment)	1	27.55	.31	.581
B (ability)	1	781.33	8.78	.005
AB	1	531.79	5.97	.019
error (b)	41	89.03	--	--
Within	45	448.54		
C (pre-post)	1	84.10	2.62	.113
AC	1	91.92	2.86	.098
BC	1	118.57	3.69	.062
ABC	1	121.85	3.80	.058
error (w)	41	32.10	--	--

Table 20

Summary of Analysis of Variance on
Figural Elaboration Scores (FE)

Source	df	MS	F	p
Between	44	1853.98		
A (treatment)	1	580.59	1.28	.265
B (ability)	1	118.52	.26	.612
AB	1	701.23	1.55	.221
error (b)	41	453.64	--	--
Within	45	1702.28		
C (pre-post)	1	1217.35	12.88	.001
AC	1	111.96	1.18	.283
BC	1	259.88	2.75	.105
ABC	1	18.58	.20	.660
error (w)	41	94.51	--	--

approaching significance was revealed on VO, favoring the Experimental Group (Table 19).

It was found that low ability Ss gained significantly more than high ability Ss on TV and on VFLU and FFLEX (Tables 12, 14, and 17), thus specific hypotheses concerning gains independent of ability level were rejected for these measures.

Analyses of covariance, using pretest scores as the covariate, did not reveal any additional significant differences between the groups, as can be seen in Tables 21-29.

A correlation matrix for all dependent measures on the pretest is shown in Table 30. It can be seen that the individual verbal scores correlate quite highly with total verbal creativity, and the nonverbal scores correlate well with total nonverbal creativity. However, the correlation between verbal and nonverbal scores is rather low.

Attitude Survey

The ANOVA on the total "creativity" scores obtained from the Attitude Survey revealed no significant differences between any groups (Table 31). The means on Table 32 all range slightly above the middle scale rating of "90."

Stretch Questionnaire

The mean ratings for the four statements (Appendix C) to be rated on the Stretch Questionnaire were (1) 6.55, (2) 7.41, (3) 7.73 and (4) 8.00. The "9" rating indicates the "most creative" attitude. Of the 22 Experimental Ss, seven (32 percent) directly expressed on the

Table 21

Summary of Analysis of Covariance on
Total Verbal Creativity Scores (TV)

Source	df	MS	F	p
A (treatment)	1	443.67	1.08	.305
B (ability)	1	490.17	1.20	.280
AB	1	448.52	1.09	.302
error	40	410.06	--	--
Total	43	1792.42	--	--

Table 22

Summary of Analysis of Covariance on
Total Nonverbal Creativity Scores (TNV)

Source	df	MS	F	p
A (treatment)	1	69.01	.13	.726
B (ability)	1	7.78	.01	.906
AB	1	41.54	.08	.785
error	40	551.66	--	--
Total	43	669.99	--	--

Table 23

Summary of Analysis of Covariance on
Verbal Fluency Scores (VFLU)

Source	df	MS	F	p
A (treatment)	1	60.40	.57	.456
B (ability)	1	288.20	2.70	.108
AB	1	113.24	1.06	.309
error	40	106.70	--	--
Total	43	568.54	--	--

Table 24

Summary of Analysis of Covariance on
Verbal Flexibility Scores (VFLEX)

Source	df	MS	F	P
A (treatment)	1	1.64	.05	.831
B (ability)	1	8.78	.25	.623
AB	1	47.51	1.33	.256
error	40	35.78	--	--
Total	43	93.71	--	--

Table 25

Summary of Analysis of Covariance on
Verbal Originality Scores (VO)

Source	df	MS	F	P
A (treatment)	1	136.40	3.78	.060
B (ability)	1	1.51	.04	.830
AB	1	.35	.010	.923
error	40	36.15	--	--
Total	43	174.41	--	--

Table 26

Summary of Analysis of Covariance on
Figural Fluency Scores (FFLU)

Source	df	MS	F	p
A (treatment)	1	3.26	.12	.736
B (ability)	1	65.51	2.32	.136
AB	1	3.56	.13	.725
error	40	28.29	--	--
Total	43	100.62	--	--

Table 27

Summary of Analysis of Covariance on
Figural Flexibility Scores (FFLEX)

Source	df	MS	F	P
A (treatment)	1	.33	.02	.894
B (ability)	1	90.70	4.93	.032
AB	1	6.35	.25	.560
error	40	18.39	--	--
Total	43	115.77	--	--

Table 28

Summary of Analysis of Covariance on
Figural Originality Scores (FO)

Source	df	MS	F	p
A (treatment)	1	8.76	.13	.724
B (ability)	1	4.44	.06	.801
AB	1	.39	.01	.940
error	40	69.40	--	--
Total	43	82.99	--	--

Table 29

Summary of Analysis of Covariance on
Figural Elaboration Scores (FE)

Source	df	MS	F	p
A (treatment)	1	16.41	.12	.732
B (ability)	1	455.01	3.31	.077
AB	1	157.97	1.14	.290
error	40	137.54	--	--
Total	43	766.93	--	--

Table 30

Correlation Matrix for All Dependent Measures on Pretests

	VFLU	VFLEX	VO	FFLU	FFLEX	FO	FE	TV	TNV
VFLU	1.000								
VFLEX	.833	1.000							
VO	.753	.692	1.000						
FFLU	.280	.258	.363	1.000					
FFLEX	.135	.123	.309	.881	1.000				
FO	.181	.273	.381	.567	.558	1.000			
FE	.116	.197	.118	.029	.075	.221	1.000		
TV	.957	.899	.887	.327	.204	.290	.148	1.000	
TNV	.229	.309	.361	.621	.642	.765	.720	.315	1.000

Table 31

Summary of Analysis of Variance of Total Creativity Scores Obtained from Attitude Survey

Source	df	MS	F	p
A (treatment)	1	10.15	.00	.980
B (ability)	1	50.84	.33	.569
AB	1	2.12	.01	.913
error	41	100.77	--	--
Total	44	163.88	--	--

Table 32

Cell Means of Total Creativity Scores
Obtained from Attitude Survey

Group	High Ability	Low Ability	Mean
Experimental	99.10	97.25	98.09
Control	99.64	96.92	98.22
Mean	99.38	97.08	

open-ended question that Stretch had "increased their creative thinking abilities" (see Appendix D).

Chapter V

DISCUSSION

The major hypothesis of this experiment, that the mean gains for Ss in the Experimental Group in total verbal and nonverbal creativity would be greater than for Ss in the Control Group, was not supported by the data.

However, specific hypothesis 3 received some support in that the Experimental Groups' gain in verbal originality (Table 19) did approach significance. Examining Table 33 of mean gains, one can see that both Experimental and Control Groups followed the same pattern of gains over all measures with the exception of VO, on which the Controls did not gain but the Experimental Ss did gain significantly. It could be hypothesized that this increase in Experimental Ss' level of verbal originality was due to the treatment. Of all the dependent measures in this study, VO would appear to be the one most related to the content material of the treatment. Because of the nature of the training material, which is essentially verbal, one would suspect that any changes due to the treatment would occur in the verbal tasks, in particular, in verbal originality. While the data supports this supposition, it also is true that the significantly greater VO gain by the Experimental Ss is an artifact of the (perhaps unexplainable) loss in VO by Ss in the high-ability control group.

Table 33

Mean Gains from Pretests to Posttests

Group	VFLU	VFLEX	VO	FFLU	FFLEX	FO	FE
EH	9.90	6.50	4.10	4.60	3.00	2.00	- 4.90
EL	12.17	6.00	3.92	8.50	6.92	6.67	-13.58
Mean E	11.04	6.25	4.01	6.55	4.96	4.34	- 9.24
CH	1.18	2.09	-4.82	6.27	3.82	9.27	- 2.55
CL	14.92	8.17	4.33	8.92	6.75	9.00	- 7.58
Mean C	8.05	5.13	- .25	7.60	5.29	9.14	- 5.07
Mean H	5.54	4.30	- .36	5.44	3.41	5.64	- 3.73
Mean L	13.55	7.09	4.13	8.71	6.84	7.84	-10.58

E = Experimental
C = Control
H = High Ability
L = Low Ability

Though the treatment did appear to increase verbal originality in the Experimental Ss, no significant differences in gains were found for the other dependent measures. The failure of the data to confirm these hypotheses may be examined from several viewpoints. First, the treatment was administered with minimal teacher direction. It appears, from examining the pupils' workbooks and speaking with the teacher, that more guidance would have been beneficial. The relatively fast paced "teacherless" condition in this study constituted a severe test of any instructional program. Recent evidence (Blount, Klausmeier, Johnson, Fredrick, & Ramsay, 1967) indicates that even a moderate degree of teacher participation can increase the effectiveness of programmed material by as much as 50%. The creativity exercises presented an entirely new experience to the children; and when the children are confronted with a material as unique as Stretch, it would be especially desirable to provide careful guidance.

It would appear, then, that it would not be advisable to use Stretch as an independent workbook for pupils at this age level to study on their own. It is felt that Stretch might be highly effective when administered following the Teacher's Guide and with considerable teacher-pupil interaction. The added teacher instruction would give pupils needed additional experience with each exercise, since in the writer's opinion, each unit in itself did not give the pupils sufficient practice.

Secondly, the creativity exercises in Stretch are presented within the context of teaching certain concepts. It is possible that this conceptual material overshadows the creativity

material. However, it also seemed to the investigator and to the teacher that the pupils did not gain much understanding of the conceptual material. While the conceptual content of the exercises appears to be valuable, it would seem to require considerable teacher presentation.

Thirdly, Stretch was administered over a period of five weeks, a relatively short period of time in which to nurture creative potential. Perhaps it would be more beneficial to extend this period in future studies.

Finally, the effect of the "fourth-grade slump" in creativity (Torrance, 1967) also may have been a detrimental factor. From earlier evidence, Torrance concluded that clear periods of decline in creative functioning seemed to occur at about ages 5, 9, 13 and 17. The majority of the pupils in this experiment were near age 9. Thus it is possible that some of the Ss were experiencing this "creative slump" and others were not. This possible fluctuation in creative functioning could have depressed any large influence of the treatment and Ss' performance on the criterion tests.

Specific hypotheses concerning total nonverbal creativity, verbal flexibility, verbal originality, figural fluency, figural originality and figural elaboration, dealing with differences between ability group gains, were not rejected. That is, both low and high ability Ss improved (decreased on FE) their creativity test scores uniformly. However, specific hypotheses concerning total verbal creativity, verbal fluency and figural flexibility were rejected in view of the finding that two ability groups performed differently on certain dependent

measures after being subjected to the same treatment. It was found that the low ability groups gained significantly more than the high ability groups on these measures. Considering these results, it might appear that the training benefited pupils of lower ability more than those of high ability. However, from examining pretest means one can see that the high ability groups scored initially higher on every variable. This is understandable, since it has been claimed that the Torrance instruments correlate substantially with intelligence (Wallach, 1968). The important point is that there would be more room for the low ability Ss to improve, thus complicating a clear interpretation of these findings.

There was a significant Treatment-Ability interaction on verbal originality scores: The high ability Controls gained significantly less than other groups. Figure 1 suggests that this finding may be a regression toward the mean, since the CH group scored significantly higher than the other groups on the pretest. This group also contains one rather "deviant" subject, which may have affected the entire group's mean performance. While this S's pretest score was considerably higher than the other Ss' scores, her posttest score dropped to half her pretest score. It was not determined whether this S could be considered an "outlyer" (one sufficiently deviant to justify excluding from analyses).

A significant gain was revealed over all Ss for all dependent measures, with the exception of figural elaboration, which showed a significant loss over all Ss, experimental and control (see Figures

1 and 2). This gain may be a practice effect, due to taking the pretest, or a result of normal maturation. That is, the actual taking of the Torrance Tests may constitute creativity training in itself. Having had one experience with such a unique set of exercises as those in the Torrance battery, it would seem to follow that subsequent performance on similar tasks would be improved. Evidence of this appeared in the testing situation when the pupils asked far fewer questions during administration of the posttests than during the pretest administration. This supposition is supported in one article (Steinmetz, 1965) which describes how the Torrance tests may be used as an effective creativity training program for industrial salesmen.

The significant loss on figural elaboration may be explained by supposing that the pretest figural stimuli were easier to elaborate upon than were the posttest stimuli. This especially would be true in the final figural task, which consisted of circles on the pretest and parallel lines on the posttest. It is suspected that children can more easily develop circles than parallel lines. It also is true that, with time held constant increases in other aspects of Ss' figural responses (fluency, flexibility, originality) reasonably might be accompanied by decreases in elaboration behavior.

For the pretest correlation matrix (Table 30), one observes the interrelationships among the measured variables. The verbal measures correlate with total verbal creativity about .91 and the nonverbal measures correlate with total nonverbal creativity about .69. However,

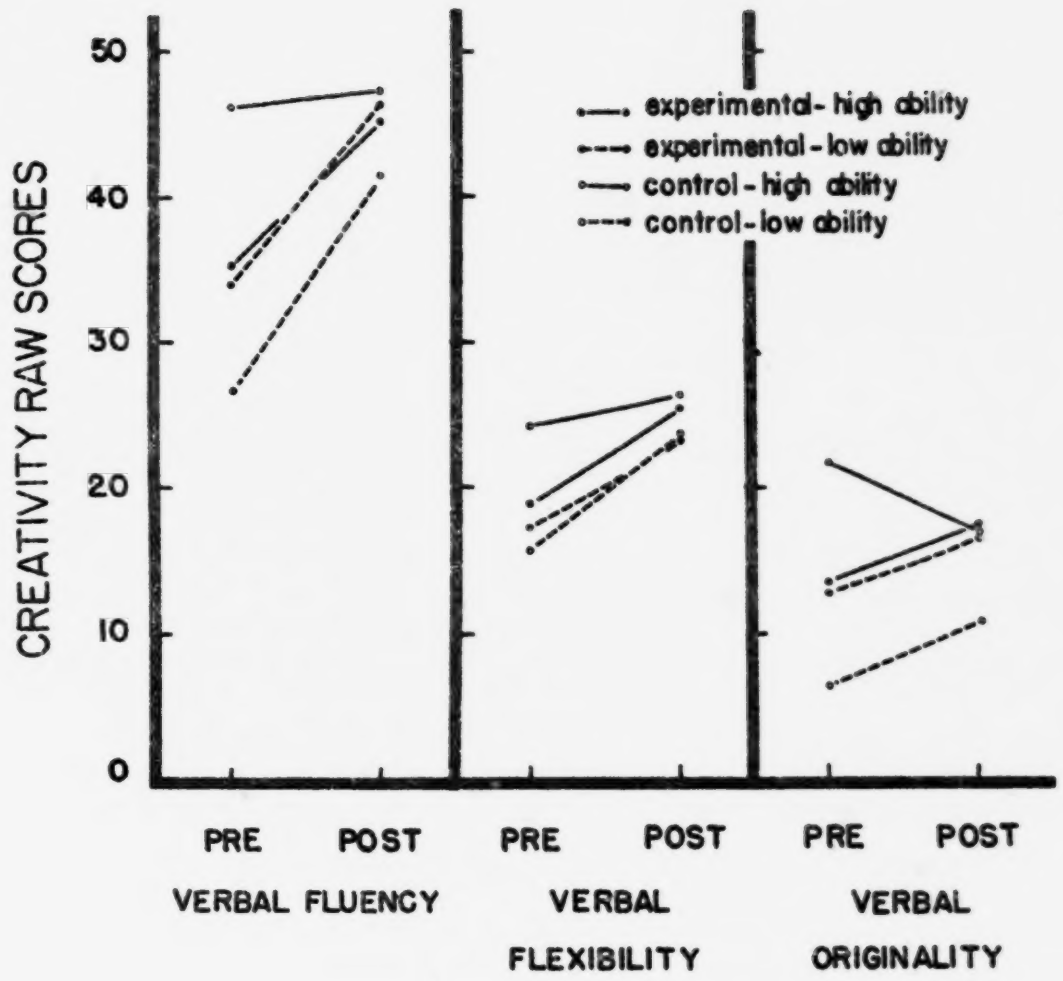

Figure 1. Pretest and Posttest Cell Means for Treatment Groups on Verbal Variables.

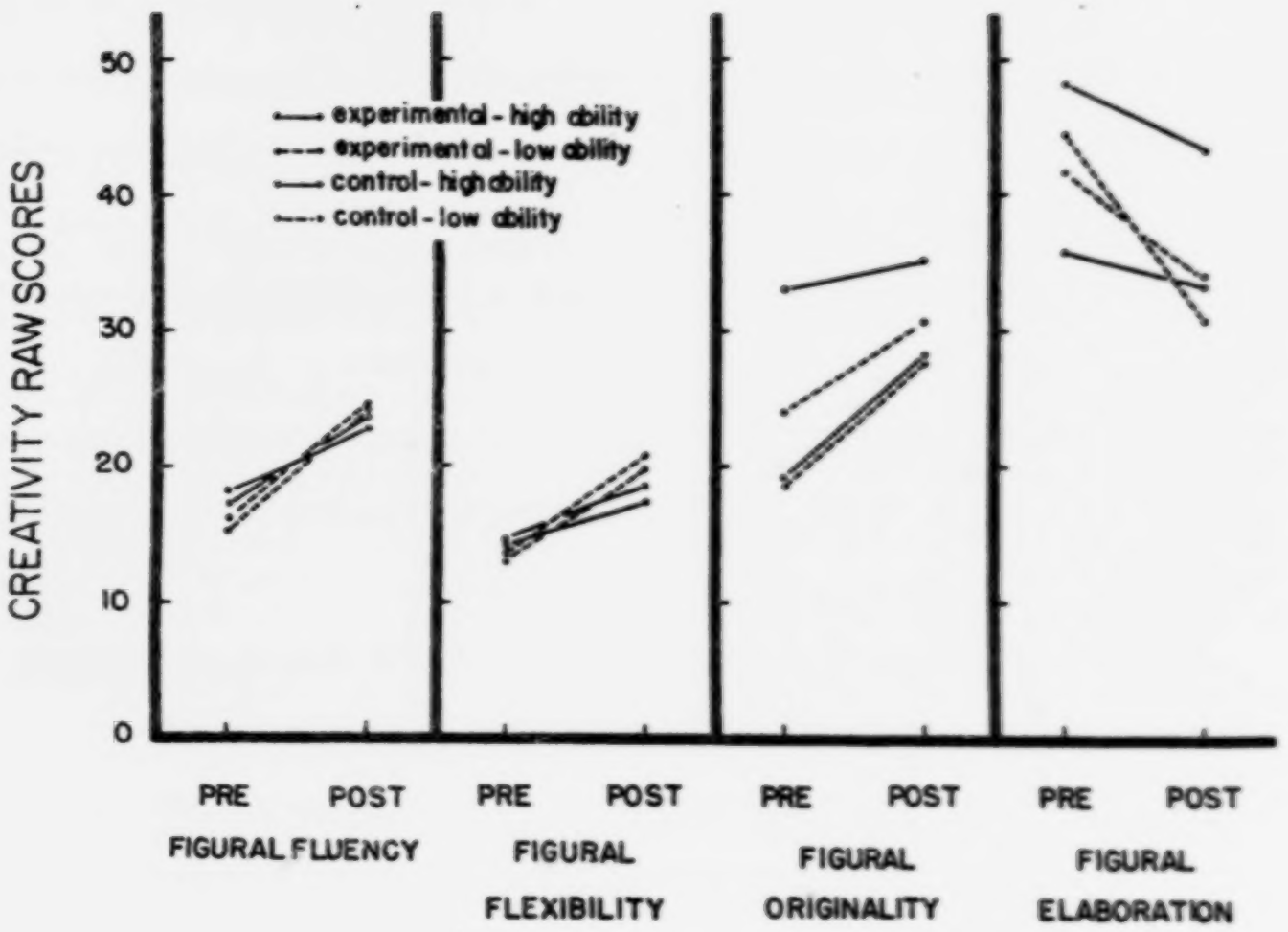

Figure 2. Pretest and Posttest Cell Means for Treatment Groups on Nonverbal Variables.

total verbal creativity correlates with total nonverbal creativity only .32, which is one reason why a total creativity score is not used.

The Attitude Survey analysis revealed no significant differences between groups. Thus, the hypothesized difference in creative attitudes was not supported by the data. The group means for the total creativity score were all only slightly above the middle rating of "90" (one-half true). It may be that the statements were too difficult for fourth grade pupils to rate accurately. In such a situation, the tendency would seem to be to rate a statement "in the middle." It also is possible that the pupils hurried through the Survey without giving it much thought, since it was given after administration of the Nonverbal Torrance Tests.

Based upon the replies to the open-ended question on the Stretch Questionnaire, a good proportion of the Experimental Ss did feel that Stretch had, in fact, increased their capacity to be creative. All experimental Ss indicated that they enjoyed the workbook experience. On each of the four statements (Appendix C) the mean ratings seemed to indicate a feeling of improvement in creative thinking abilities. This especially is true for Statement 4, "Now that I've read the booklet, Stretch, I believe I am more creative than I used to be," whose mean rating was "8" ("9" was the "most creative" response). These pupil responses appear to be good indications of the effectiveness of Stretch, particularly regarding pupil attitudes and self-concepts.

No outstanding correlations or discrepancies were found between the teacher's evaluation of her "most creative" pupils and the pupils

who scored highest on the measures of fluency, flexibility, originality and elaboration. That is, the teacher's ratings were generally, but not perfectly, in accord with the results of the test batteries.

In conclusion, in order to facilitate creative thinking, pupils must be provided with open-ended situations in which they have time to think, to use their imaginations and to discover. The lack of structure in such situations often is disturbing to many teachers. Although the results of this study are inconclusive, a workbook such as Stretch, used in conjunction with the Teacher's Guide, may provide the necessary structure.

Needed Research

Although the general purpose of this experiment, to test the effectiveness of Stretch as an independent "self-contained" workbook, was satisfied, additional research concerning this particular training program is needed. Stretch should be tested making complete use of the Teacher's Guide and allowing for more teacher-pupil interaction. The program also could be administered over a longer period of time. Furthermore, an experimental design accounting for practice effects and maturation could be used. Perhaps, the Four-group Experimental-Control Design (Kerlinger, 1965) would be suitable. In this design, in addition to the Experimental and Control Groups, two additional groups are included: Control Group 3, receiving the treatment and the posttest, and Control Group 4, receiving only the posttest.

Stretch also should be tested using other age groups to determine the age level for which it is most effective. A series of cross sectional and longitudinal studies also would provide valuable information.

Although much of the research concerning creativity training methods is still in the preliminary stages, it may not be necessary to wait for definitive studies. Even while their stability and validity are still being established, as is the case with Stretch, current procedures (most of which can boast of high content and construct validity) are usable and useful now and should be employed. "No healthier prospect could confront school people if a climate for creativity is their true goal" (Passow, 1965).

Chapter VI

SUMMARY AND CONCLUSIONS

The major purpose of this experiment was to determine whether a particular training program presented as an individual "self-contained" workbook would increase the level of creative performance of certain fourth grade pupils. The effect of the treatment was judged in terms of differences in gains in ability to do creative thinking, as measured by the Torrance Tests of Creative Thinking, between an Experimental and a Control Group. Differences between the performance of high and lower ability groups also were considered.

Two groups of fourth grade pupils, one Experimental and one Control, totaling 45 subjects, provided the population of the study. Both groups were pretested and posttested with the Torrance Tests of Creative Thinking.

The Experimental Group was exposed to a creativity training workbook, Stretch. The Control Group had no contact with this treatment variable. Instead, they studied a "placebo" workbook.

The major hypothesis of the experiment was that the Experimental Group would gain significantly more than the Control Group in both total verbal and total nonverbal creativity. The analysis of data revealed no significant differences. However, from analyses of the data plus informal observations, it seems reasonable to draw the

following conclusions: (1) It appears that Stretch did improve the level of performance of verbal originality of the pupils in the Experimental Group. (2) It appears that the scores on certain dependent measures by pupils of lower ability were more improved by Stretch than were those of high ability groups, although an "artificial ceiling" effect may have occurred. (3) All subjects, both Experimental and Control, improved significantly on almost all measures. The Torrance battery itself may have produced a practice effect and improved performance in creative thinking test scores.

No significant differences were found between the groups in attitudes toward creativity.

Despite the lack of convincing statistical data to support the hypotheses of this experiment, it is the opinion of the investigator that the Stretch workbook has the potential to be a valuable tool for the training of creative thinking in children.

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APPENDICES

APPENDIX A

Sample Instructions for Administering the Figural Tests, Form B

Preliminary Instructions to Pupils

Before passing out the test booklets, the teacher or administrator should give a brief orientation that will make sense to the particular group, be honest, arouse interest and motivate performance. Some modification of the following might be used:

> "I believe you will have a lot of fun doing the activities we have planned for this period. We are going to do some things that will give you a chance to see how good you are at thinking up new ideas and solving problems. They will call for all of the imagination and thinking ability you have. So I hope that you will put on your best thinking cap and that you will enjoy yourself."

Specific Instructions for Administering Test Activities

"In this booklet are three interesting things for you to do. All of them will give you a chance to use your imagination to think of ideas and to put them together in various ways. In each activity, we want you to think of the most interesting and unusual ideas you can--ideas that no one else in this group will think of. After you think of an idea keep adding to it and build it up so that it will tell the most interesting and exciting story possible.

"You will be given a time limit on each activity, so make good use of your time. Work fast but don't rush. Try to keep thinking of ideas, but if you run out of ideas before time is called, sit quietly and wait until you are told to turn to the next page.

"If you have any questions after we start, don't speak out loud. Raise your hand and I shall come to your desk and try to answer your questions."

Ask the class to turn to page 2, Activity 1: PICTURE CONSTRUCTION. Ask those who can to read the instructions with you, continuing as follows:

"Below is a piece of colored paper in the form of a curved shape. Think of a picture or an object which you can draw with this piece of paper as a part. On the back of these shapes you will find a thin layer of paper that can be peeled away. (Examiner demonstrates.) Now you can stick your colored shape wherever you want it to make the picture you have in mind. Stick yours on the next page where you want it and press down on it. Then add lines with your pencil to make your picture.

"Try to think of a picture that no one else will think of. Keep adding new ideas to your first idea to make it tell as interesting and exciting a story as you can.

"When you have completed your picture, think up a name or title for it and write it at the bottom of the page in the space provided. Make your title as clever and unusual as possible. Use it to help you tell your story.

"Go ahead with your picture, making it different from anyone else's and making it tell as complete and as interesting a story as possible. You will have ten minutes."

Using a stop watch, allow TEN MINUTES before calling time. Ask the group to turn to page 4, Activity 2: PICTURE COMPLETION. Again, ask the group to read the instructions as you read them aloud.

"By adding lines to the incomplete figures on this page and the next page, you can sketch some interesting objects or pictures. Again,, try to think of some picture or object that no one else will think of. Try to make it tell as complete and as interesting a story as you can by adding to and building up your first idea. Make up an interesting title for each of your drawings and write it at the bottom of each block next to the number of the figure.

All right, go ahead! You will have ten minutes."

Using a stop watch, allow TEN MINUTES before calling time. Ask the pupils to turn to page 6, Activity 3: CIRCLES. Again, have the group read the instructions as you read them aloud:

"In ten minutes see how many objects or pictures you can make from the circles below and on the next page. The circles should be the main part of whatever you make. With pencil add lines to the circles to complete your picture. You can place marks inside the circles, outside the circles, or both inside and outside the circles--wherever you want to in order to make your picture. Try to think of things that no one else will think of. Make as many different pictures or objects as you can and put as many ideas as you can in each one. Make them tell as complete and as interesting a story as you can. Add names or titles below the objects.

"All right, go ahead. You have ten minutes."

APPENDIX B

Attitude Survey

90/91

Name_____

Grade_____

Data_____

Sex_____

These questions deal with how you feel about new ideas and thinking. For each question, place a checkmark (✓) in the blank which best tells the degree to which you think the sentence is true. For example:

	Never True			One-half True				Always True
1. I enjoy new activities.	___	___	___	___	___	___	___	___	___
	1	2	3	4	(5)	6	7	8	9

There are no right or wrong answers, just be honest.

*In data analysis, ratings reversed.

	Never True				One-half True				Always True
	1	2	3	4	(5)	6	7	8	9
1. Just about anything in the world could be changed for the better.	___	___	___	___	___	___	___	___	___
2. I think I have a good sense of humor.	___	___	___	___	___	___	___	___	___
*3. When solving problems, it's best just to find one or two good ideas, rather than thinking of lots of possible ideas.	___	___	___	___	___	___	___	___	___
4. Anyone can learn to think of new ideas.	___	___	___	___	___	___	___	___	___
5. I often think about new ideas.	___	___	___	___	___	___	___	___	___
6. I often think of wild ideas.	___	___	___	___	___	___	___	___	___
7. I think my ideas are about as good as anyone else's.	___	___	___	___	___	___	___	___	___
*8. Unusual or wild ideas are usually of no help in solving a serious problem.	___	___	___	___	___	___	___	___	___
*9. Few people can find new ideas.	___	___	___	___	___	___	___	___	___

	Never True				One-half True				Always True
10. I think I am creative.	1	2	3	4	(5)	6	7	8	9
*11. Sometimes I am afraid my ideas might be laughed at.	1	2	3	4	(5)	6	7	8	9
12. Wild ideas can sometimes lead to good ideas.	1	2	3	4	(5)	6	7	8	9
*13. It's best to make sure an idea is a good one before telling a group about it.	1	2	3	4	(5)	6	7	8	9
*14. People can make their memory better, but they cannot learn to think better or get better ideas.	1	2	3	4	(5)	6	7	8	9
*15. I usually criticize wild ideas, no matter who thinks of them.	1	2	3	4	(5)	6	7	8	9
16. I often look for better ways of doing things.	1	2	3	4	(5)	6	7	8	9
*17. It's best to think of only good, practical ideas.	1	2	3	4	(5)	6	7	8	9

APPENDIX C

94/95

Stretch Questionnaire

Name _____

1. Since working in Stretch, I understand where many new ideas come from.

1 2 3 4 (5) 6 7 8 9

2. Since working in Stretch, I will think of unusual ideas more than before.

1 2 3 4 (5) 6 7 8 9

3. Since working in Stretch, I believe I can think of more ideas than before.

1 2 3 4 (5) 6 7 8 9

4. Now that I've read the booklet, Stretch, I believe I am more creative than I used to be.

1 2 3 4 (5) 6 7 8 9

5. Did you enjoy working in the booklet, Stretch? Why or why not?

APPENDIX D

Responses of Increased Creativity Expressed by the Subjects on Question 5 of the Stretch Questionnaire

5. Did you enjoy working in the booklet, Stretch?
Why or why not?

"I did because I could use my imagination."

"in one way because I think it made me more creative"

"Yes, it let me think of new ideas"

"Yes, because it gave me a chance to think creatively"

"Yes, because I can think and create more"

"Yes, because I can think of new ideas more"

"It let me use my imagination. Yes."

APPENDIX E

Sample Page from The Sullivan Programmed Reading Book 12, Level 1

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APPENDIX F

Teacher Evaluation Form

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APPENDIX G

Brief Form of Teacher's Guide

Instructions to the Teacher for Administering

Stretch: Exercises for Developing Concepts and Imagination

Stretch presents twenty-two challenging concepts which can be introduced to young children. They are presented within exercises which are intended to exercise a child's imagination and, hopefully, increase his powers of creative thinking. Many of the concepts will be familiar to children who have lived for seven or eight years. The collection of concepts has been planned so there would be a balance in emphasis between sociological and intellectual concepts, for Myers and Torrance believe that both kinds of understandings should be taught in the elementary school.

This Idea Book is designed to be a flexible teaching material. Each unit is organized into three parts: an introductory or warming-up phase, a second phase, in which the individual pupil is encouraged to become more deeply involved in the concept or activity, and a following-through phase, in which the pupil is invited to "take-off" on the idea and express himself in some form. In this instance, Stretch will be used as a relatively independent workbook, with little teacher direction. The teacher is requested to encourage the use of imagination in the pupils, especially in those pupils who "need a push" If necessary, give the children examples to get them going.

Please instruct the children not to discuss their respective workbooks with each other. This is very important.

Please collect all booklets after each session and do not allow the children to work in the booklets outside of the sessions. Each session should last about one-half hour.

The concepts presented are as follows:

Unit 1: Crash! An Exercise about Sound

An exercise about noise was chosen to be first in this collection of units for developing concepts. Obviously, the idea of noise or sound does not need to be developed in the minds of young children. It has been there for most of their lives. Perhaps "Crash!" is a logical choice for leading off because it deals with a very familiar subject, and therefore it won't occasion any consternation among the pupils.

Unit 2: The Moose-Headed Teddy Bear-An Exercise about Novel Combinations

The idea of this exercise is that diverse elements can be united to make novel combinations.

Unit 3: Stop! Moderation; knowing when to stop

This exercise proceeds on two levels. Literally, the pupil is asked to think about the fact that there is an end to almost every event or activity. The pupil is asked to consider the consequences of not knowing when to stop, a common problem with youngsters. On a deeper level, the pupil can think about the reasons for talking too much or eating too much. In one sense, then, the concept to be developed is moderation. However, the exercise is really about cessation of an activity.

Unit 4: Going, Gone-Movement

This exercise deals with phenomena moving in space and time. Encourage your pupils to use humor or to tell a story in their rendering of the second picture. This exercise should bring out hidden resources and thinking abilities in children.

Unit 5: Which Ball Do You Want?-Judgment

This unit deals with two broad topics that are really the same--intelligent purchasing and making judgments. When we make judgments, we are evaluating, and evaluation is the mental operation which is crucial to the success of creative thinking.

Unit 6: Pairs-Contrast

Three contrasting pairs are presented to show the pupil that things with the same name may be quite different in many respects.

Unit 7: Hal and Three More-Neighborliness

The concept for this unit is actually reciprocity. The main reason for having the child think of another title is that we want to encourage him to abstract the events and relationships presented in the exercise.

Unit 8: Birds-Personality

The pupil is to be involved in the idea of personality. However, the personalities to be projected are not meant for human animals, but for feathered animals; and so this is also a lesson in personification.

Unit 9: Together-Belonging

Very few things are more important than belonging to young people. This is an exercise whose theme is basic to the happiness of everyone. In cases of irregular family rationships, a child may not know how to respond to the final question, "Who belongs to you?" If he feels no one belongs to him, you can help him see that many people who care about him actually do belong to him in the sense of loving affiliation.

Unit 10: The Big Red Truck-Personification

Personification comes naturally to children. It is also common in the thinking of adults, who give names to automobiles, boats, rivers and storms and regard them in some ways as they would other persons. The third section of the exercise calls for some reflective thinking on the part of the pupil. He is reminded that, although at times it might seem quite pleasant to be a bird or a truck or a kite, he can never be anything but a person. The subtle message in this part of the exercises is: "As long as you are a person, why not try to be the best person you can be?" The type of thinking that is stimulated by this exercise is sometimes called fantasy. There is a considerable amount of evaluative thinking interwoven in the fantasizing, however. In effect, the pupil is asked to make comparisons

and to reason about why he would prefer to be one non-human thing rather than another.

Unit 11: Stretch-Extension

The pupil is invited to define the term after encountering a number of instances of stretching. While engaged in the exercise, we hope to lead him to the generalization that certain objects are able to resume their original shape after being stretched and others are not. The idea that things stretch can be applied to both physical and non-physical items.

Unit 12: Three Flags-Deception

Perhaps it is going a little too far to say that this exercise is about deception. Fundamentally, it is about the faultiness of our senses. It should be pointed out that things are not always what they seem to be. It is important that your pupils actually compare the flags by measuring them with rulers, string, pieces of paper, or whatever they can think of. This exercise can help the pupils to become more aware of the humorous and paradoxical aspects of the world of sense experience.

Unit 13: Is Seeing Believing?-Proof

This exercise consists of three anecdotes about children who make extravagant claims. At the end of each story, the reader is left with a feeling that the contention of the child might possibly be valid if there were more

evidence to support his claim. Inplicit in the stories, then, is the idea that people are able to back up their statements with various kinds of evidence. It is important that your pupils perceive that the evidence does not always have to be of a certain kind.

Unit 14: Lunch Time-Propriety

Knowing the proper time and place in which to do things is difficult for all of us. The ploy of this exercise is for the pupil to be led to see that what we do and how we do it are functions of time, place, custom and inclination.

Unit 15: About You-Individuality

Much divergent behavior is desirable, both from the standpoint of the healthful effects that accrue to the child in expressing his individuality and from the standpoint of enriching the social and physical milieus in which he lives. A brief discussion about variability in humans will serve as a good introduction to the exercise. If your pupils are allowed to exchange their reactions to these questions, they will most likely have a chance to see that they are both similar to and different from their classmates. This is, of course, the point of the exercise.

Unit 16: A Lucky Boy-Sharing

The pupils should regard Gary fortunate in having friends who will share with him. At the end of the first part of the exercise, the pupil is asked to cite instances in the story of sharing. Here are the occasions when individuals in the story shared.

1. Gary and his brother Tim share a bedroom.
2. The mothers of the children, through their car pool, share the responsibilities of transporting their children to school.
3. Hal shared his umbrella with Mary and Gary.
4. Mario gave part of his lunch to Gary when he could not locate his lunch box.

We hope the pupil will reach the conclusion that sharing is very important to successful interpersonal relationships, for making life worthwhile.

Unit 17: Sue Swings-Readiness

In order to perform tasks, children must be physiologically and psychologically ready. Fundamentally, the exercises were written so that youngsters could understand themselves better.

Unit 18: Remember-Memory

The simple theme of this exercise is that our memories are terribly important to us.

Unit 19: Come Back-Cycles

The notion of cycles is not a concept of early childhood. On the other hand, children are familiar with birds returning to their nesting grounds in the spring, with the recurring seasons, and with many other recurring patterns.

Unit 20: Put Yourself in the Picture-Customs

This exercise is designed to make the young pupil aware of the fact that what he eats and the way he dresses and the way he talks are all a function of the time and place in which he lives. It is a rather subtle introduction to the concept of custom.

Unit 21: For a Better World-Change

The concept which the pupil is to deal with is change, but the underlying idea of this exercise is that one change produces other changes. This seems to be an exercise in pretending, but it involves more than just idle daydreaming. If the exercise is taken seriously, some genuine thinking will go on. The idea of one change causing a chain of other changes can be found in discussions of interpersonal relationships, world events, stories and so on.

Unit 22: Once Again-Repetition

Although we may not be aware of the fact, repetition is one of our very most common experiences. Whether or not young children are aware of constant patterns

of repetition is problematical. It is said that they are very fond of routine, so it is likely that the concept is possessed by all children, even if they are not able to verbalize too well about it.

APPENDIX H

Sample Scoring Sheet for Torrance Tests of Creative Thinking, Figural Form B

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